

## 4.2.10.FLIR Maximum Range

### 4.2.10.1.Purpose

The purpose of this test is to determine the maximum range at which a FLIR can detect the presence of a mission relatable target and then to determine the range that the target can be identified.

### 4.2.10.2.General

As with radar testing, FLIR maximum range can be defined a number of different ways. For the purposes of this test, two values will be determined based upon their tactical significance to the sample system. First, the maximum range at which a mission relatable target becomes visible on the display will be determined. This range is significant since it is the maximum range at which targets of opportunity can be picked up for initial steering. WFOV is normally used in this situation and will be the test mode. Next, the maximum range at which tactically significant targets can be identified will be determined. For ships, this requires the determination of ship class and for land vehicles the type target, such as tank or truck. This range is important since in most cases it determines the range at which an attack can be committed. NFOV is normally used in this situation and will be the test mode. Since the FLIR determines bearing to the target only, an independent source of target range is required for the test. Most FLIR equipped platforms also have a radar. This will be the source of range for the sample procedure; however, if the test platform is not radar equipped, an alternate source of range truth data will be required. In most cases, this will require space positioning data on both the test aircraft and target supplied by a ground based test range radar, a costly procedure available at very limited locations.

Maximum range is dependent on five basic variables, three are functions of the FLIR design and two external to the FLIR. The three internal to the FLIR include the system optics, the detector performance and the signal processor signal to noise characteristics. These are under the control of the designer of the system and their cumulative measurement is the goal of this test. The fourth variable is the transmittance of the atmosphere and can be documented by recording the atmospheric conditions

at the time of the test. Care should be taken to perform the tests during representative days. For example, performing all the tests for a FLIR designed for maritime use in northern Pacific weather, while based out of a dry desert area, would not be representative. Generally, a wide range of conditions over several flights is best. The final variable is the IR intensity of the target source. [Ref. 37: pp. 3.9-3.10]. For this test, a mission relatable target will be used and completely described within the results. This will allow the most reliable relation of the results to a realistically mission relatable environment.

### 4.2.10.3.Instrumentation

Data cards are required for this test, a voice recorder is optional.

### 4.2.10.4.Data Required

Record the temperature, relative humidity and a complete description of any visible moisture or smoke in the test area including haze, fog, rain or clouds along with the maximum and minimum cloud layer altitudes and visibility. Record the maximum range at which the target is first discernable and the maximum range at which the target can be identified. Record a complete visual description of the target. Qualitatively evaluate the level of clutter detected around the target.

### 4.2.10.5.Procedure

Obtain the test area surface temperature, relative humidity and visibility along with the type of obstructions to visibility from the local weather office. Record any visible moisture such as rain, fog or clouds noted along the sensor line of sight during the test. Choose a charted, mission relatable target, or visually find a target and fly outbound until FLIR contact is lost. Turn inbound to the chosen target and detect it on radar. Fly inbound until the target is first broken out on the FLIR display at WFOV. Note the radar derived range. Switch to NFOV, updating the cursor placement as required, to maintain the target on the display. Note the radar derived range at which the target can be identified. The class of ship, type of surface vehicle (such as tank, truck or train) or type of structure (such as hangar, factory, power plant etc.) must be discernable.

Visually find the target and completely describe it, including comments as to whether the target is operating since this may be an indicator of target temperature. Qualitatively assess the level of IR clutter around the target. If possible, repeat the test during varying atmospheric conditions and for as wide a variety of mission relatable targets as possible.

#### **4.2.10.6.Data Analysis and Presentation**

Relate the test day atmospheric conditions to the conditions expected in a mission relatable scenario. Relate the type or class of target, size of target and local clutter level, to the expected mission relatable scenario. Relate the maximum detection range to the requirement to scan for targets of opportunity early enough to steer in their direction and set up for an identification and subsequent attack and to the range of detection of isolated targets given approximate targeting data. Relate the maximum identification range to the requirement to maneuver for an attack of the target after identification and to the envelope of the expected target's defensive sensors and weapons. The FLIR identification range, in most cases, should allow for identification and attack prior to the target being able to destroy the FLIR platform.

#### **4.2.10.7.Data Cards**

A sample data card is provided as card 66.

CARD NUMBER \_\_\_\_\_ TIME \_\_\_\_\_ PRIORITY L/M/H

## FLIR MAXIMUM RANGE

[CLIMB TO \_\_\_\_\_ FEET MSL AND SET \_\_\_\_\_ KIAS. BEGIN OVERHEAD \_\_\_\_\_ AND TURN TOWARD THE \_\_\_\_\_ TARGET. ACQUIRE THE TARGET ON RADAR AND STEER THE FLIR IN THE TARGET'S DIRECTION IN WFOV. WHEN THE TARGET IS FIRST DISCERNABLE, MARK THE RADAR RANGE. CONTINUE INBOUND IN NFOV. MARK THE RANGE WHEN IDENTIFICATION IS POSSIBLE. REPEAT FOR THE \_\_\_\_\_ AND \_\_\_\_\_ TARGETS.]

CLOUD LAYERS:

VISIBLE MOISTURE:

TEMPERATURE \_\_\_\_\_

RELATIVE HUMIDITY \_\_\_\_\_

DESCRIBE TARGET 1:

DETECTION RANGE \_\_\_\_\_

IDENTIFICATION RANGE \_\_\_\_\_

DESCRIBE TARGET 2:

DETECTION RANGE \_\_\_\_\_

IDENTIFICATION RANGE \_\_\_\_\_

DESCRIBE TARGET 3:

DETECTION RANGE \_\_\_\_\_

IDENTIFICATION RANGE \_\_\_\_\_